



BAT Methodology

A Holistic Integrative Model of Delivery, using Chaos to understanding Dynamicism and Complexity of social systems.



Cyberia Group

The Business Architecture Tool (BAT®)

The Business Architecture Tool (BAT®) embedded in Systems Methodology: A Holistic Integrative Model of Delivery, using Chaos to understanding Dynamicism and Complexity of social systems.

In business and our social systems, we find that some are winning while others are losing, all without a clear reason as to why? This uncertainty and lack of control ascribed to the apparent randomness creates a terrible feeling of insecurity. Even the successful organisations are not sure of themselves any more. The “game” seem to change all the time, yet our average response

to these occurrences are still grounded in dated mindsets and rhetoric, entrenching the dominant management culture, which keeps reproducing the same solutions for problems. This unfortunately will remain in place unless we realize that because of our dated worldview, we see the world as increasingly

complex and chaotic because we use inadequate concepts to explain it (i.e., when we understand something, we no longer interpret it as chaotic or complex).

Many noted scholars and researcher suggest, “The new game requires learning a new language”. These notions are derived from those who have, over the last 50 years, confronted the required shift of paradigm. This paradigm shift, from understanding our world as a mindless mechanical system (Newtonian, Cartesian paradigm), to a multi-minded socio-cultural R&D system (Systems, Complexity paradigm) has been instrumental in those leaders taking this giant leap. The diagram below explains this migration in terms of the traditional mathematical expression of defining a circle, and the resultant innovations that came forth in adopting the new description.

Euclid vs Descartes

The radical departure by Descartes from the Euclidean description of geometric shapes. The example uses the description of a circle to illustrate the difference.

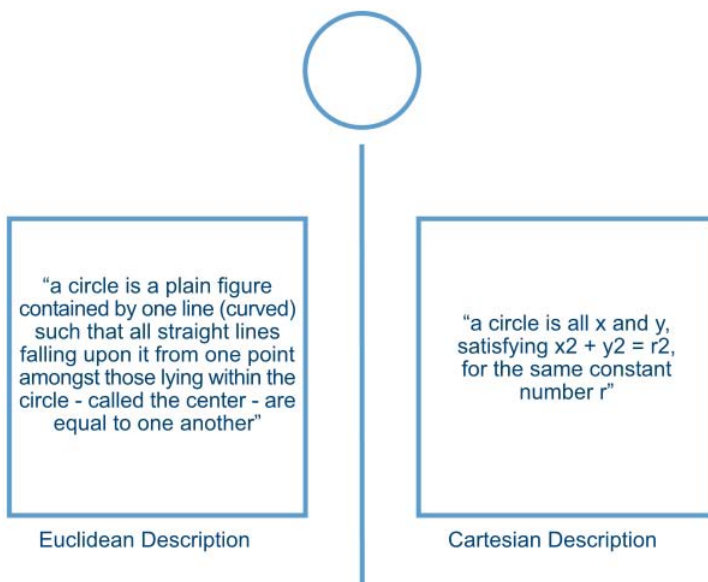


Figure 1: Euclidian Vs Cartesian description

This too, presented a departure and eventual displacement of dated techniques, to more accurate and reliable versions. The management paradigm of Mechanical and



Systemic perspectives, are similarly presented with an opportunity to better describe and define our social systems.

Our obsessions with models and the interpretation of these are also perhaps to blame for the lack in adopting a systemic and integrative perspective. Our managers and leaders tend to forget that models are mere abstractions of reality, and cannot be relied upon as being a “silver bullet”.

Levels of Reality & Hermeneutics

The views we have on constructs of reality of our universe, is that of life itself, i.e. our experience of the world. Then there is another view, that of our mathematical models (math being the singular truth). Thirdly, we have our computer models (attempts to replicate our real world experience in a virtual world). Each of these models, are mere abstractions of our experiences, and all of them have limits in terms of predictability, accuracy, etc...

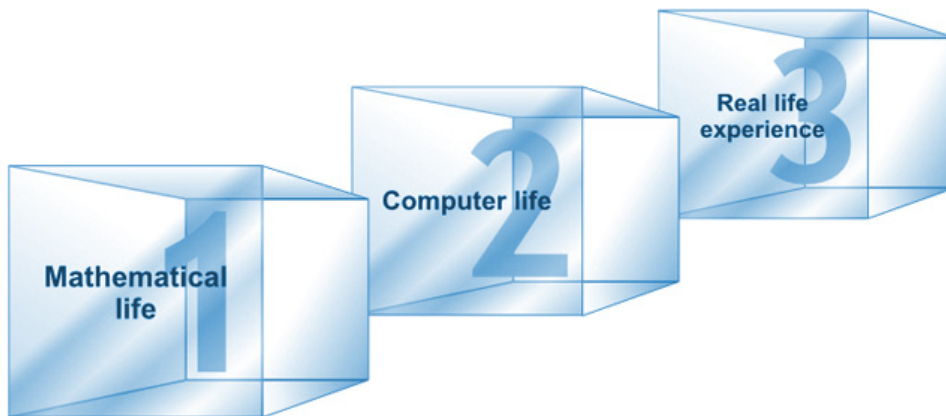


Figure 2: Models of reality

Figure 2 above seeks to depict the view we hold when talking about models, models in themselves thus are incomplete, some may be really good and accurate descriptions within high levels of confidence, but they are non-theless, a model.

Another reason for the slow uptake of systems sciences could be the pervasive mechanical having created a “laziness to think”. This implies that we have become creatures of habit, wanting to be “fed the gospel”, as opposed “creating it”, depending upon old, easy and simple models of our world, and unwilling to accept that these have become impotent in a dynamic world order.

There has also been a profound shift in our way of knowing, i.e., from analytical thinking (dealing with independent variables), to systems thinking (dealing with interdependent variables). While the analytical approach has remained for nearly four hundred years, systems thinking has gone through three generations of change: from Operations Research to Cybernetics and finally Interactive Design (Ackoff, Gharajadeghi). Systems methodology deals with interdependency and self-organisation, as well as purposeful behavior of multi-minded systems.

Systems Methodology

Recent versions of systems methodology presents a language of interaction and design developed to face the dilemma of social systems where the whole is becoming more and more interdependent while the parts display choice and behave independently (Ackoff). The methodology gives us a way to see through chaos and understand complexities. The foundation of this model is the interaction of four elements of systems thinking:

- I. Holistic Thinking (iteration of structure, function and process);*
- II. Operational Thinking (understanding chaos and complexity);*
- III. Systems Theories (a socio-cultural view);*
- IV. Interactive Design (creating a feasible whole with infeasible parts);*

1: Holistic Thinking

Structure, Function, Process and Context

Analytical thinking assumes that understanding structure is sufficient to understand a system. For synthetic thinking, function is the key for seeing the whole. The behaviorist, in turn looks to the process, the how question, for the necessary answer to define the whole. Each one has been used as the core concept of a different inquiring system producing a tremendous amount of R&D information and knowledge.

- Analysis has been the essence of classical science. The scientific method assumes that the whole is nothing but the sum of the parts, and thus understanding the structure is both necessary and sufficient to understanding the whole.
- Synthesis has been the main instrument of the functional approach. By defining a system by its outcome, synthesis puts the subject in the context of the larger system of which it is a part, and then studies the effects it produces in its environment.
- Process orientation, on the other hand, has long been the focus of behavioral science. It basically deals with the how question.

Gharajedaghi (2004) suggests that perhaps the classical school of management, with its input orientation, deals basically with structure. The neo-classical school, with its notion of "management by objective," is concerned with functions. And the total quality movement, with its concern for control, is preoccupied with the process. Gharajedaghi contends that structure, function, and process represent three aspects of the same thing and with the containing environment they form a complementary set.

Together they define the whole or make the understanding of the whole possible. Structure defines components and their relationships; function defines the outcomes or results produced; process explicitly defines the sequence of activities and the know-how required to produce the outcome.

As such, these interdependent variables form a circular relationship, each variable co-producing the others, and in turn are co-produced by the others.

This demands an iterative inquiry to understand complexity. An iterative process of applying simple rules is at the core of nature's mysterious ability to produce complex phenomena so effortlessly. Iterations of structure, function, and process in a given



context would examine assumptions and properties of each element in its own right, then in relationship with other members of the set. Subsequent iterations would establish validity of the assumptions and successively produce an integrated design.

Action Research Process:
Adapted from MacIsaac, 1995.

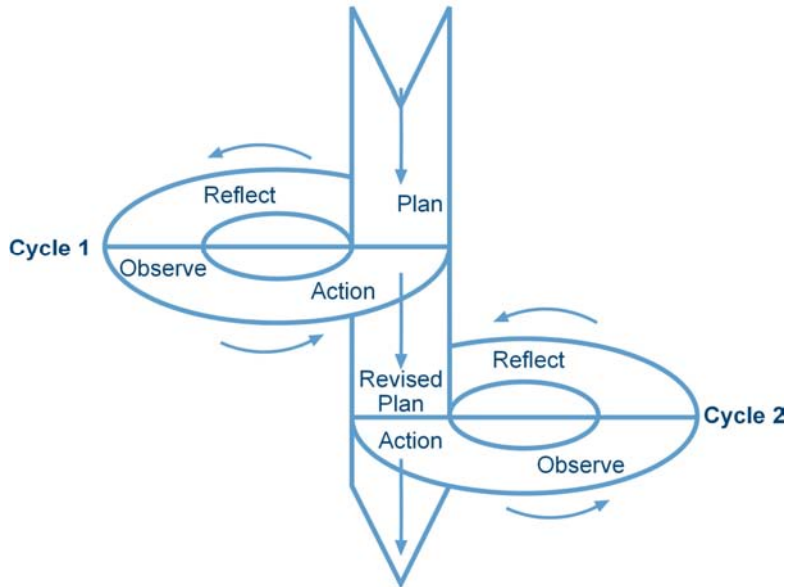


Figure 4: Process of iteration using action-based research

The diagram above explains the importance of iteration in process; the example uses typical action-based research to display the repeating loops that generate the learning and improvements.

2: Operational Thinking

Understanding Chaos and Complexity

Complexity is a relative term. It depends on the number and the nature of interactions among the variables involved. Open loop systems with linear, independent variables are considered simpler than interdependent variables forming non-linear closed loops with a delayed response.

Complexity Revolution

(matrix indicates the migration in model thinking)

Reductionist, Newtonian, Cartesian, Linear Model	Complexity, Systemic, Holistic, Evolutionary model
Moves from hierarchical thought processes	Thinks systems and networks
Moves from anthropocentric (human) view	Thinks about biological, eco-centric viewpoints
Moves from a linear cause-effect basis	Appreciate dynamic interactions and uncertainty
Reduction of the whole into parts	Understand the whole is greater than the sum of parts
Analyses from a rational mechanical world	See and move with intuition
Encourages over-analysis	Search for and appreciate synthesis

Figure 5: Paradigm shift from Mechanical to Complexity

Key aspects in complexity and chaos are closed loops, non-linearity, and delayed response. The first step for understanding complexity is to appreciate the iterative and dynamic nature of closed loop systems and their counterintuitive behavior. Consider the following two simple examples:

1. A saving account in a bank earning simple 10% interest reflects an open loop behavior. Both yearly earnings and the amount of principal remain constant and total sum would increase at a slow pace.

Closed and Open Loop Systems

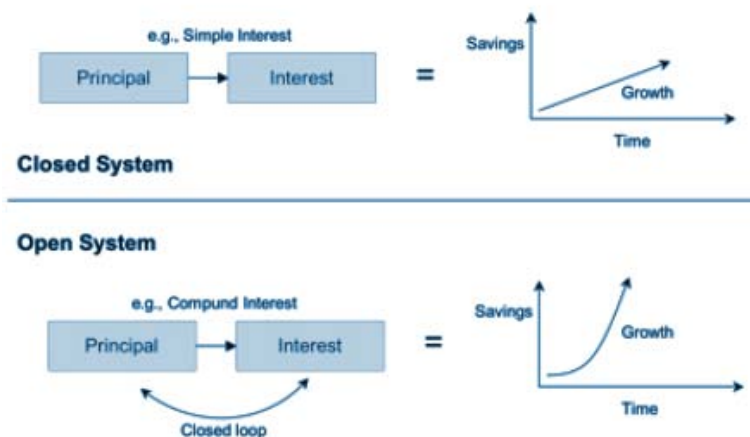


Figure 6: Open and Closed loop systems archetypes

- However, if the savings in the bank were to earn 10% compound interest, it would represent a closed loop behavior and the money in the saving account will grow exponentially, doubling every seven years (principal of 10,000 would amount to 1,280,000 if left untouched for 56 years, compared to 66000 accumulated under simple interest).

If however, the interest rate in the above example varied according to market conditions then we would be facing a nonlinear system (in closed loop thinking linear and non-linear refer to the rate of change, not the state of a system). The curves would correlate to the above returns in terms of linear and non-linear.

When looking at the dynamic behavior of a simple negative feedback loop (goal seeking), the attention must be upon the counter-intuitive impact (oscillation) of introducing a delay function to our simple negative feedback loop.

Negative Feedback loops

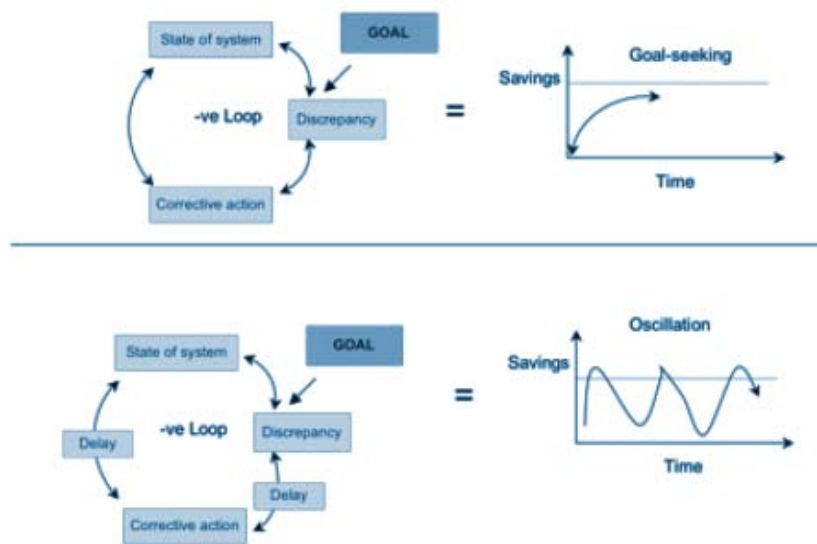


Figure 6: Counter-intuitive nature of delays into negative feedback loop

When visiting the more common phenomenon known as positive feedback loop, we observe the classic exponential growth curve, as shown in figure 7 below.

Positive Feedback loops



- Now, if we add the impact of carrying capacity (market fluctuations), and superimpose the reality of a delay function to the positive feedback loop, we would create a monster, the infamous “multi-loop nonlinear feedback system.”

This is the system that according to chaos theory produces chaotic behavior, and helps to explain the collapse of Dotcoms, fiasco of Enron, and faith of many organisations who pursue a blind short-term growth strategy with no regard for the limitations imposed by carrying capacity of the system and/or its environment. The overshoot and collapse scenario reflects the cases where the growth strategy has an additional negative impact on the carrying capacity of the system (see figure 8 below).

Carrying capacity of systems

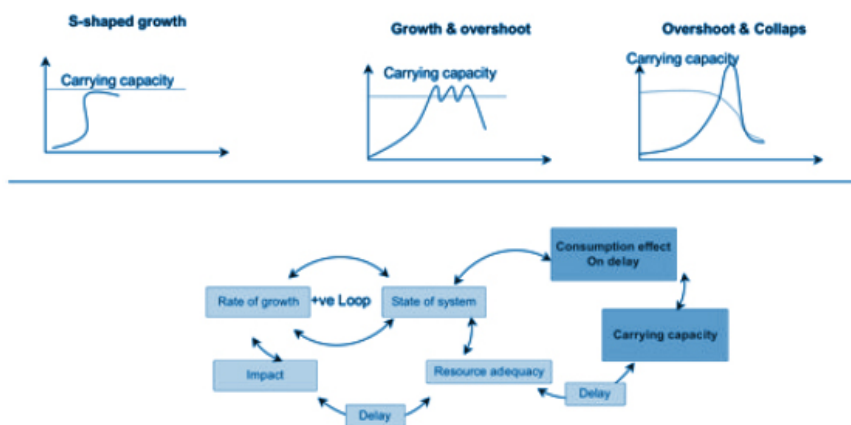


Figure 8: Carrying capacity of systems

The emphasis is the interaction of multiple feedback loops being the prime source for generating chaos and complexity. Understanding this dynamics is the essential step to get a handle on the notion of interdependency and counter-intuitive behavior of social systems (Irwin, McGraw Hill, 2000).

Our cognitive ability has evolved from our Newtonian models and the assumptions of unidirectional causality or open loop thinking, and concerned with independent variables. As such, we experience extreme difficulty in visualising the behavior of interdependent variables or the outcome of closed loop systems. According to Barry Richmond, creator of the i-think model, “The way we think is outdated, creating problems, which we are ill-equipped to resolve due to the way we think.” Thinking consists of two activities: constructing mental models and simulating them in order to draw conclusions and make decisions.

Our mathematical tools are insufficient, else how do we explain that we have been applying the same set of solution architecture to various social problems (drugs, poverty, crime, illiteracy and mal-distribution of wealth), for most of the last fifty years? Stephen Wolfram, in his book, *New Kind Of Science* (2002) has a critical observation: “The idea of describing behavior in terms of mathematical equations works well where the behavior is fairly simple. It almost inevitably fails

whenever the behavior is more complex. Indeed, there are many common phenomena about which theoretical science has had remarkably very little to say. Degree of difficulty encounter in mathematical representation of a phenomenon increases exponentially by the degree of its complexity.” He demonstrates how systems, too complex for traditional mathematics, could obey simple operational rules, and how simplistic iterative computer programs capture the essential characteristics of complex phenomena.

Operational Thinking:

Is an ingenious way to overcome the difficulties encountered in constructing and simulating complex mental models (Richmond, 2000). Relying solely on mathematical representation for dealing with complex phenomenon has been a practical difficulty. Combining operational thinking with more manageable forms of mathematical representation (i-think software) makes it practical to get a handle on multi-loop nonlinear feedback systems.

Importantly, multi-loop nonlinear feedback systems exhibit chaotic behavior, i.e. there is order in its chaos. Such systems seem to be attracted to a particular pattern of behavior, and using operational thinking we can discover this pattern and recognize the “Second Order Machine” (the attractor) that is locking the system to its existing pattern.

These are implicit sets of organising principles, residing at the core of organisation’s collective memory, and are usually the most resilient principles.

The triumphant resurgence of old patterns of behavior despite the concerted efforts of change agents is an uninterrupted saga of despair, which is supported by the Second Order Machine. Unless these Attractors are made explicit and dismantled, the temporary effects of interventions will be shortlived.

The pattern recognition is critical for understanding and changing the undesirable behavior. To recap, mapping the dynamic behavior of a system is to capture the interaction of positive and negative feedback loops. This interaction, defines the critical interdependencies among the variables involved. The mapping process helps to change the default behavior and overcome the shortcomings of our cognitive abilities.

3: Systems Theories

Gharajedaghi (1999) argued extensively that five systems principles of openness, purposefulness, multidimensionality, emergent property, and counter-intuitiveness, along with five systems dimensions define the essential characteristics and the behavior of a socio-cultural system.

Openness:

Means that the behavior of open (living) systems can be understood only in the context of their environment, and as such, no problems or solutions can be entertained free of context. Yet, our mechanical response to solution generation invariably ignores this truth, thus yielding the same non- solution all over again. Open (living) systems exhibit a tendency toward a predefined order, if left alone they reproduce themselves (cultural norms and codes are the social equivalent of biological DNA). This implies that Self-organization by default will invariably reproduce the existing order.

Purposefulness:

Why people do what they do is the matter of purpose and choice (having rational, emotional, and cultural dimensions). Rational choice is the domain of self-interest, or the interest of the decision maker, not the observer. A rational choice is not necessarily a wise choice. It reflects only the perceived interest of the decision maker at the time. The emotional choice is the domain of beauty and excitement. We do lots of things because they are exciting or, more precisely, because they are challenging. If the excitement of a good challenge were not part of our decision criteria, life would be boring. In other words, setting and seeking attainable goals is a banal existence.

Multidimensionality:

Is probably one of the most potent principles of systems thinking, and relates to the ability to see complementary relations in opposing tendencies. The mutual interdependence of opposing tendencies is characterized by an "and " instead of an "or" relationship. Unfortunately, for the majority of cultures, a fallacy has dominated the treatment of opposing tendencies as a duality in a zero-sum game (a winner and a loser). This mechanistic and linear cause effect scourge can be seen everywhere (collectivity & individuality; security & freedom; modernity & tradition, etc). This represents an "or" relationship, whereas Multidimensionality states that lose/lose and win/win as well as win/lose are possibilities.

Counter-intuitiveness:

Social dynamics stand on a level of complexity beyond the reach of the analytical approach. Counter-intuitiveness means that actions intended to produce a desired outcome may, in fact, generate opposite results. Things can get worse before getting better, or vice versa (we often win or lose for the wrong reason). To appreciate the nature of counter-intuitive behavior, the practical consequences of cause and effect must be understood deeper (cause and effect may be separated in time-space; can replace one another; a single event may have multiple effects; an effect may have an independent life of its own; removing the cause will not necessarily remove the effect).

Emergent Properties:

These are the property of the whole, not the parts, and thus cannot be analyzed; they are the product of interactions among the parts (interaction implies dynamic process). Thus, emergent phenomenon is a time-dependent state reproduced continuously online and real time. Therefore, life, love, happiness, and success are not a one-time proposition; they have to be reproduced continuously. If the processes that generate them come to an end, the phenomena cease to exist as well. They cannot be stored or saved for future use.

Systems Dimensions:

The parameters that co-produce the state of a socio-cultural system are found in the following five dimensions (Ackoff): wealth, power, knowledge, beauty, and values.

- The generation and distribution of wealth, or the production of necessary goods and services and their equitable distribution;
- Development and duplication of power, the question of legitimacy, authority, and responsibility or, in general, the notion of governance;
- The generation and dissemination of truth, or information, knowledge, and understanding;
- The creation and dissemination of beauty, the emotional aspect of being, the meaningfulness and excitement of what is done in and of itself;

- Formation and institutionalisation of values for the purpose of regulating and maintaining interpersonal relationships: cooperation, coalition, competition, and conflict.

Interactive Design:

Interactive design from Russell Ackoff, explicitly recognises that choice is at the heart of human development - "Development is the capacity to choose; design is a vehicle for enhancement of choice and holistic thinking. Designers seek to choose rather than predict the future."

Interactive design is about creating a feasible whole with infeasible parts. It is both the art of finding differences among things that seem similar and the science of finding similarities among things that seem different. Solution designers try to understand rational, emotional, and cultural dimensions of choice and produce a design that satisfies a multitude of functions. There are four distinct elements of interactive design are; Participation; Formulation of the Mess; Idealisation; Realisation. Self-organizing, purposeful, socio-cultural systems are self-evolving; they do not adapt to their environments but coevolve with it. Like all open systems a purposeful socio-cultural system exhibits a tendency toward a predefined order (its behavior is guided by an implicit, shared image). In the short term it tends to approximate and reproduce its pattern of existence very closely. To change this pattern of behavior the implicit shared image (attractor) need to be changed, and can only be done by a participative design process (people are more likely to accept an idea when they have had a hand in shaping it).

Formulating the Mess:

Separation of defining problems from designing solution is a unique characteristic of interactive design. According to Ackoff, "We fail more often not because we fail to solve the problems we face but because we fail to face the right problem." Problem is defined neither as deviation from a norm nor in terms of universal constraints (lack of time, resources, or knowledge). It is defined as a mess, an interactive set of problems reflecting the future implicit in the present operation.

Idealisation:

The distinctive characteristic of idealisation is the notion of backward planning. It starts with the assumption that the system has been destroyed overnight and that the designers have been given the opportunity to recreate the system from a clean slate. The only constraints are that the outcome be technologically feasible and operationally viable.

Design:

Is a process for operationalising the most exciting vision of the future that the designers are capable of producing (generating a new system to replace the existing).

Realisation:

Successive approximation is at the core of realising an ideal design. Realisation takes place in a real-world environment, thus designers must identify all the constraints that might interfere with proper implementation of the design. These constraints usually fall into the following three distinct categories.



- **Type-1 Constraints:** cannot be removed within the existing framework, and require revisions and improvements of the design in order to create a target design capable of being implemented. Target-1 would be the first approximation of the unconstrained design. If necessary, subsequent approximations will identify Target II and Target III generations of the desired design. It is critical that Type-1 constraints be continuously monitored so that the target design can further approximate the idealised design as soon as these constraints are removed. The realisation effort, therefore, will not be a one-time proposition. Successive approximations of the desired state make up the evolutionary process by which the transformation effort is conducted.
- **Type-2 Constraints:** removal of these constraints requires extensive preparation, as it consists of activities that consume considerable time, resources, knowledge and management talent. These activities usually involve redesign of the products (if necessary), redesign of throughput, and redesign of organisational processes. For control and quality purposes, all critical assumptions and expectations about the selected course of actions must be explicitly recorded and continuously monitored.
- **Type-3 Constraints:** deals essentially with behavioral constraints (constraints that can be removed if designers so desire). Selling the idea, removing resistance to change, ensuring acceptance, cultivating support, and providing training are among the efforts targeted at constraints that are basically self-imposed. These constraints, taken together, act as the cultural default of the organization, and their function is to reinforce the status quo. Without a prior foundation of trust and commitment, the system would simply refuse to undergo the planned transformation irreversibly. And in this context, dissolving the "second-order machine" is the most critical phase of realising the design.

Conclusion:

Using the Business Architecture Tool (BAT®), as a systemic framework of implementation is most useful. Additionally, leading thinking tools such as interactive design (Ackoff), and System-of-system (SoSM, Jackson), coupled with an iterative deployment method provide a robust framework to deal with emerging challenges of seemingly complex and chaotic socio-cultural systems.

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